



Reusable Launch Vehicle Program Fact Sheet

Introduction

The Reusable Launch Vehicle (RLV) Technology Program is a partnership between NASA and industry to design a new generation of launch vehicles expected to dramatically lower the costs of putting payloads in space. Today's launch systems are complex and costly to operate. The RLV program stresses a simple, fully reusable vehicle that will operate much like an airliner. NASA hopes to cut payload costs from \$10,000 a pound, as it is today, to about \$1,000 a pound. To accomplish this goal, NASA sought proposals from U. S. aerospace industries for the RLV Technology Program.

Lockheed Martin chosen for X-33 program

In July 1996, NASA selected Lockheed Martin Skunk Works of Palmdale, Calif., to design, build and test the X-33 experimental vehicle for the RLV program. The reusable, wedge-shaped X-33, called VentureStar, will be about half the size of a full-scale RLV. The X-33 will not take payloads into space; it will be used only to demonstrate the vehicle's design and simulate flight characteristics of the full-scale RLV. Lockheed Martin plans to conduct the first flight test in March 1999 and achieve at least 15 flights by December 1999. NASA has budgeted \$941 million for the project through 1999. Lockheed Martin will invest \$220 million in its X-33 design. After the test program, government and industry will decide whether or not to continue with a full-scale RLV.

Stennis Space Center will test engines

The John C. Stennis Space Center (SSC) in South Mississippi will conduct all of the engine testing for the X-33 and some liquid oxygen and liquid hydrogen composite tank testing, resulting in about \$30 million of development testing. SSC plans to begin testing engine components in mid-1998, followed by tests of the Rocketdyne-built aerospike engine. The engines will be tested in one of SSC's large test stands used to test the Space Shuttle Main Engine since May 1975. The turbopumps are the heart of a rocket engine. They are extremely high-powered parts of the engine that boost the pressure of the propellants, which are burned in the combustion chamber.

RLV not a Space Shuttle replacement

The RLV will fly much like the Space Shuttle. It will take off vertically and land on a runway. However, there are differences between the two vehicles. The RLV will be a means of transport only. It will not be used as a science platform like the current Space Shuttle.

Also, the RLV will be a single-stage-to-orbit spacecraft it does not drop off components on its way to

orbit. It will rely totally on its own built-in engines to reach orbit, omitting the need for additional boosters. Unlike the shuttle, the RLV will use a new linear aerospike engine, which looks and runs much differently than the bell-shaped Space Shuttle Main Engine.

The linear aerospike engine

NASA considered the aerospike engine for the Space Shuttle 25 years ago, but opted to use the Space Shuttle Main Engine, also built by Rocketdyne. The aerospike has been revived and enhanced to power the RLV. The aerospike nozzle is shaped like an inverted bell nozzle. Where a bell nozzle begins small and widens toward the opening of the nozzle like a cone, the aerospike decreases in width toward the opening of the nozzle. The aerospike is 75 percent shorter than an equivalent bell nozzle engine. It is also lighter, and its form blends well with the RLV's lifting body airframe for lower drag during flight. The shape spreads thrust loads evenly at the base of the vehicle, causing less structural weight. The half-scale X-33 test vehicle will use two smaller test versions of the aerospike. The full-scale RLV will use seven aerospike engines.

Stennis is NASA's lead center for propulsion testing

Because of its experience in rocket engine testing spanning more than 30 years, NASA designated SSC as the space agency's lead center for rocket propulsion testing in May 1996. The new assignment gives SSC the responsibility for managing all of NASA's rocket engine test assets, activities and resources. Other NASA facilities used for propulsion testing are: Marshall Space Flight Center, Huntsville, Ala.; Lewis Research Center's Plum Brook station near Sandusky, Ohio; and the Johnson Space Center's White Sands Test Facility, Las Cruces, N. M. SSC's other responsibilities as lead propulsion testing center include development testing, facility investments, consolidation strategies and determining the best location for NASA's propulsion tests.

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